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PATENT OF INVENTION

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Gravity Separator with Automatic Water and Hydrocarbon Control
Company: SOCIÉTÉ DE MÉCANIQUE ET DE TRANSPORTS, residing in France (Seine-Maritime):

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(Patent of Invention, whose issuance was postponed by Article 11, Sect. 7, of the Law of July 5, 1844, amended by the Law of April 7, 1902).

This invention concerns a gravity separator with automatic controls, particularly, but not exclusively designed to separate dirty water and liquid hydrocarbons.

The separator in this invention has several advantages over the devices of this type that are already known, which will emerge from the following description.

It is generally known that the separation of dirty water and liquid hydrocarbons, which are the main components of water pollution from washing and ballasting tanks of vehicles transporting petroleum products and processing petroleum products—and in most cases, at very high levels of operation and for small concentrations of hydrocarbons—is done in very large volume capacities, in proportion to the operating levels, divided into more or less large compartments by means of partitions, outside or with a roof.

The two components of the mixture, in their travels through the separator, have a tendency to separate by gravity due to the difference in density, the water being evacuated through a hole located at a low point, the hydrocarbons accumulating in the upper part. The latter are periodically evacuated by means of a spout whose level is varied when the layer becomes thick enough. Very often, the separation is made difficult by the presence of large quantities of air pumped with the mixture.

This invention is designed, in general--due to the shape of the parts of the separator that is its subject and to their special arrangement--to reduce the volume and cut the price of said separator—to the same market level—by better yield and prior evacuation of air potentially pumped with the mixture, to automate the purge of hydrocarbons and make periodic cleaning easier.

This invention will be better understood from the following description and the attached drawing, which is a simple diagram, given mainly by way of indication, but not limited. In this drawing:

Figure 1 shows, in elevation, part in axial section and part torn out, a separator made according to one embodiment of the invention.

Figure 2 shows the bottom of the same separator in elevation, part in axial section, along a vertical plane perpendicular to the one in the preceding view.

In one embodiment of the invention, shown in the attached drawing, the separator is a cylindrical tank 1 with a vertical axis equipped with different parts. The upper part of said tank 1 is open and has a deaeration and diffusion body 2 comprised of a bicylindro-conical capacity with a vertical axis. The

mixture is carried by the hose 5 to the mid-height of that capacity. The air and the gases are evacuated through the upper conduit 6. The mixture is diffused into the diffusion plane 7 by the lower conduit, with the same capacity, fluted in a truncated cone 3 and equipped with a small cone-screen 4 of conicity opposite the one of said truncated cone 3 whose position is adjustable.

A spout 16, equipped with an exhaust pipe 17, whose position can be adjusted in height, automatically recovers the hydrocarbons on the surface 7'.

The lower part of the separator is equipped with a truncated cone strainer 3, protected by a circular flat screen 9, the end of the exhaust pipe 10 of the purified water to the regulation column 11.

The bottom of the separator, due to a concrete fitting, has a dihedral shape composed of two inclined planes whose intersections with the tank 1 are the curves 21 and 22. Their inclined line of intersection 20, having a so-called "valley bottom" shape, takes the solid deposits that have accumulated to orifice 18, during periodic purges.

The regulation column 11, which ends in a cylindrical-conical fluting 12 forming a spout on top, supports the cylindrical collector 13 with an open upper part whose bottom is equipped with an orifice with an exhaust pipe 14.

The foot of the regulation column is equipped with a manhole for cleaning 19.

The levels of the purified water spout 12, on one hand, and the hydrocarbon spout 16 on the other are staggered in relation to one another by a height h – level 12 being the lowest – connected to the distance *a* of planes 7 and 7' already defined and, to the relative density of the hydrocarbons and the dirty water of which the mixture is composed, and on the other hand, to the height z_1 of the plane of water 15 above the rim of the spout 12 and to the loss of charge z_2 of the liquid current between section 7 and the plane 15 through the double inequation (for a given level) to automate the hydrocarbon purge:

$$\frac{z_1 + z_2}{1 - d} < \frac{h}{1-d} < a$$

This invention is in no way limited to the embodiment just described; on the contrary, it includes all variations of it.

ABSTRACT

This invention, concerning an automatic gravity separator, is characterized by the following points, taken separately or in combination:

1. The separator has a vertical axis and includes a deaeration and diffusion body where the mixture comes in; the diffuser is closed by a divergent cone equipped with a cone-screen of conicity opposite that of said divergent cone;

2. The water goes out through the bottom, through a spout connected to a regulation column with a free air spout on top;

3. The hydrocarbons go out through a spout located on the surface of the separator 5 at a level higher than the spout of the regulation column, according to the conditions defined by the double inequation:

$$\frac{z_1 + z_2}{1 - d} < \frac{h}{1-d} < a$$

4. The bottom of the tank has a so-called "valley bottom" shape, with an orifice at the low point, so solid deposits can be evacuated by periodic purges.

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